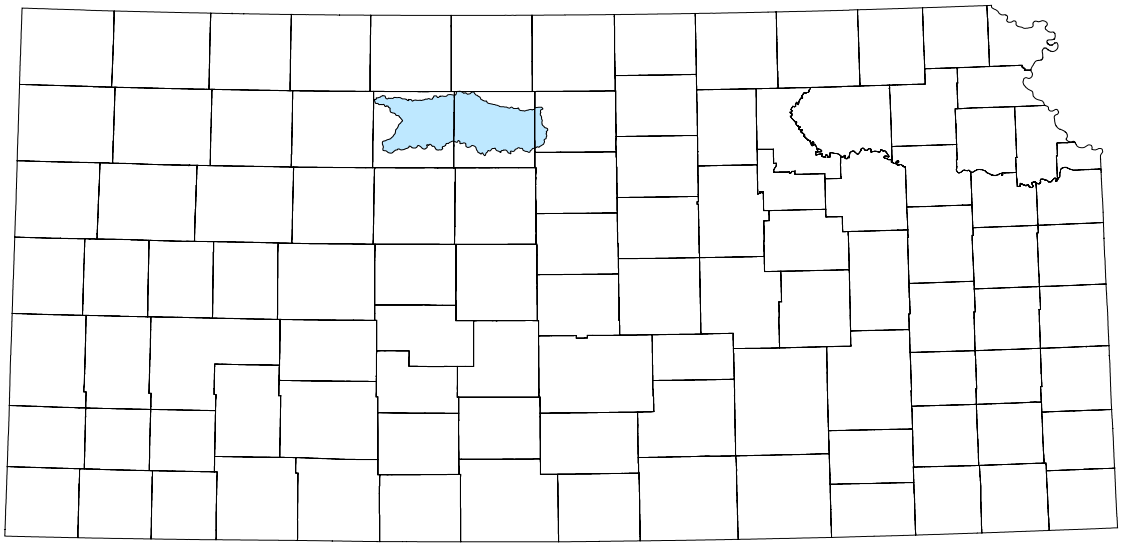
KANSAS
Rapid Watershed Assessment

Lower South Fork Solomon Watershed
Hydrologic Unit Code – 10260014



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Resource Profile

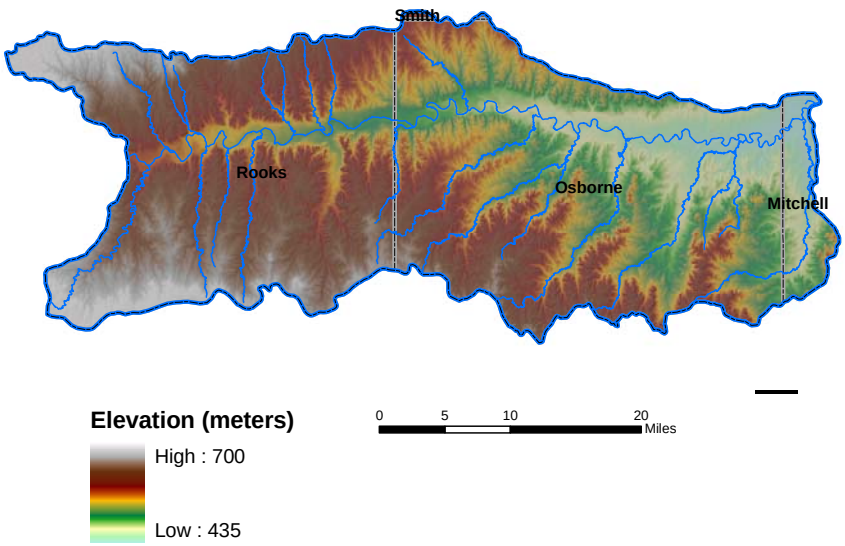
1.0 Purpose

This rapid watershed assessment (RWA) organizes resource information into one document that local conservationists, units of government, and others can use to identify existing resource conditions and conservation opportunities. This will enable the user to direct technical and financial resources to the local needs in the watershed. This RWA provides a brief description of the Lower South Fork Solomon sub-basin's natural resources, resource concerns, conservation needs, and ability to resolve natural resource issues and concerns.

2.0 Introduction

The Lower South Fork Solomon 8-Digit Hydrologic Unit Code (HUC) sub-basin is comprised of 675,479 acres in northwestern Kansas and primarily includes the counties of Rooks and Osborne with small land coverage in Mitchell. This sub-basin is located in the Solomon River Basin, and drains into Lake Waconda as it flows from west to east. Thirty-five percent of the sub-basin is in grain and row crop; 62 percent is in grassland, pasture, and hay; and the rest is in other various land uses.[5]

Relief Map[1]



Resource concerns are numerous in the sub-basin. Stakeholders in the watershed emphasize the importance of implementing use efficiency from surface and groundwater sources, promoting a reduction in commercial chemical and fertilizer runoff, reducing livestock and pet waste runoff, and increasing the awareness of the public concerning water quality in the watershed.

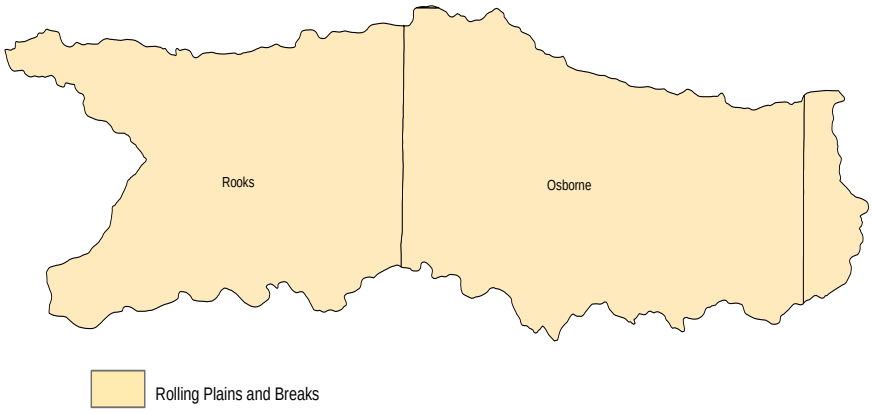
In 2002, there were approximately 559 farms with an average size of 1,072 acres in the Lower South Fork Solomon sub-basin.[2]

Three Natural Resources Conservation Service (NRCS) field offices, three county conservation districts (CDs), and the Solomon Valley Resource Conservation and Development (RC&D) area provides conservation assistance to all the counties in the watershed.

3.0 Physical Description

The physical description of the Lower South Fork Solomon sub-basin provides detailed information so the user can better understand the natural resources associated with this geographical land unit.

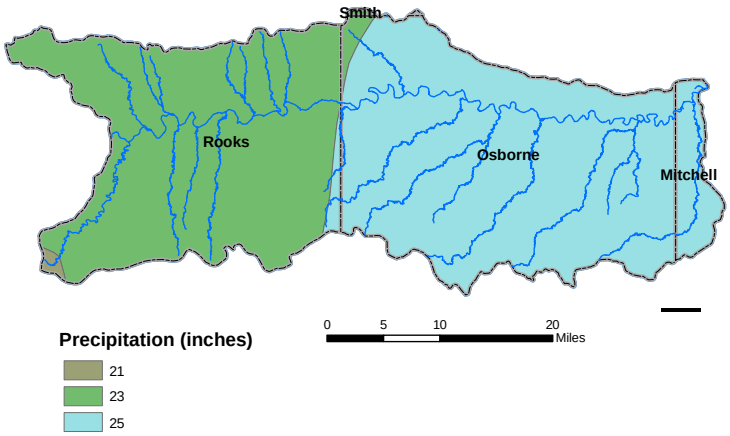
3.1 Common Resource Area (CRA) Map[3]



73.1 Rolling Plains and Breaks: The Rolling Plains and Breaks CRA is dissected plains having broad undulating to rolling ridge-tops, loess mantled, and hilly to steep side-slopes. Local relief reaches 300 feet and is dissected with narrow drainage ways and river valleys. Soils are deep on the ridge-tops and moderately deep to shallow on the side-slopes. Pre-settlement vegetation was mid grass prairies. Most of this land is in farms, both small grain crops and native grasses.

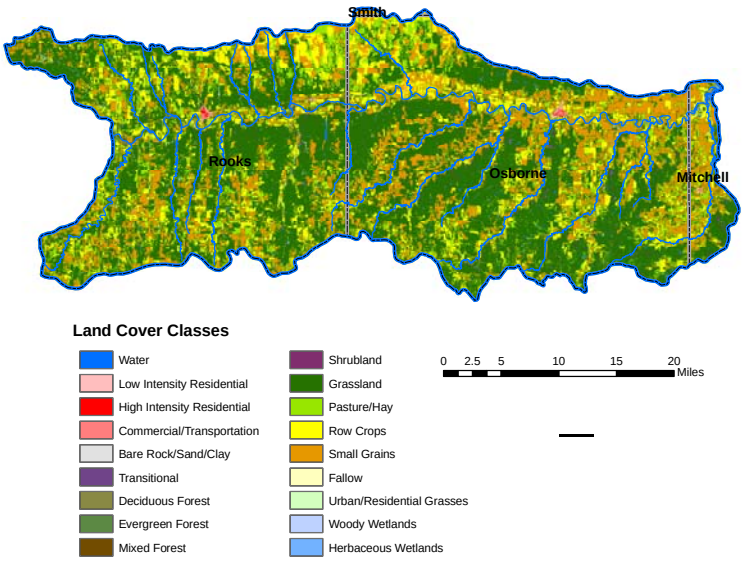
3.2 Precipitation Map[4]

The map below depicts the average precipitation occurring within the sub-basin.



3.3 Land Use and Land Cover Distribution Map[5]

The map below represents the distribution of land cover and land use as defined by the National Land Cover Dataset (NLCD).



3.3.1 Land Use and Land Cover Summary Table

Land Cover/Land Use	Ownership							
	Private		Public		Tribal			
	Acres	%	Acres	%	Acres	%	Totals	%
Open Water	3,088	0.46	772	0.11	0	0	3,860	0.57
Low Intensity Residential	291	0.04	0	0.00	0	0	291	0.04
High Intensity Residential	330	0.05	0	0.00	0	0	330	0.05
Commercial/Industrial/Transportation	1,316	0.19	0	0.00	0	0	1,316	0.19
Bare Rock/Sand/Clay	994	0.15	1	0.00	0	0	995	0.15
Quarries/Strip Mines/Gravel Pits	0	0.00	0	0.00	0	0	0	0.00
Transitional	4	0.00	0	0.00	0	0	4	0.00
Deciduous Forest	4,442	0.66	55	0.01	0	0	4,497	0.67
Evergreen Forest	154	0.02	0	0.00	0	0	154	0.02
Mixed Forest	1	0.00	0	0.00	0	0	1	0.00
Shrubland	7,989	1.18	11	0.00	0	0	8,000	1.18
Grasslands/Herbaceous	360,472	53.37	583	0.09	0	0	361,055	53.45
Pasture/Hay	55,323	8.19	127	0.02	0	0	55,450	8.21
Row Crops	99,886	14.79	1,057	0.16	0	0	100,944	14.94
Small Grains	131,436	19.46	1,095	0.16	0	0	132,531	19.62
Fallow	116	0.02	0	0.00	0	0	116	0.02
Urban/Recreational	341	0.05	0	0.00	0	0	341	0.05
Woody Wetlands	81	0.01	8	0.00	0	0	89	0.01
Emergent Herbaceous Wetlands	5,310	0.79	193	0.03	0	0	5,503	0.81
HUC Totals[a]	679,733	99.42	3,950	0.58	0	0	675,479	100.00

[a]: *Totals are approximate due to rounding and small unknown acreages.*

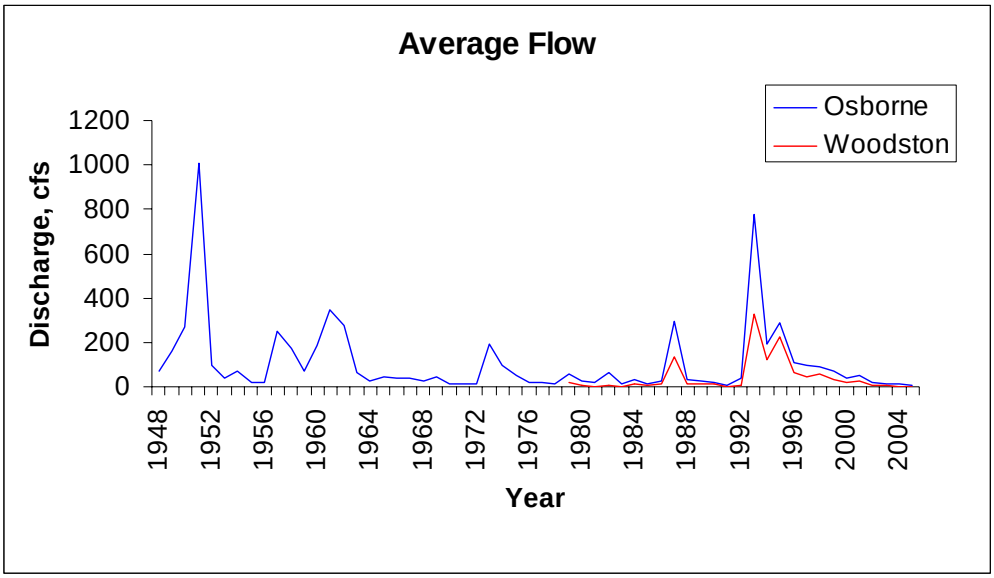
Special Considerations for This 8-Digit HUC:

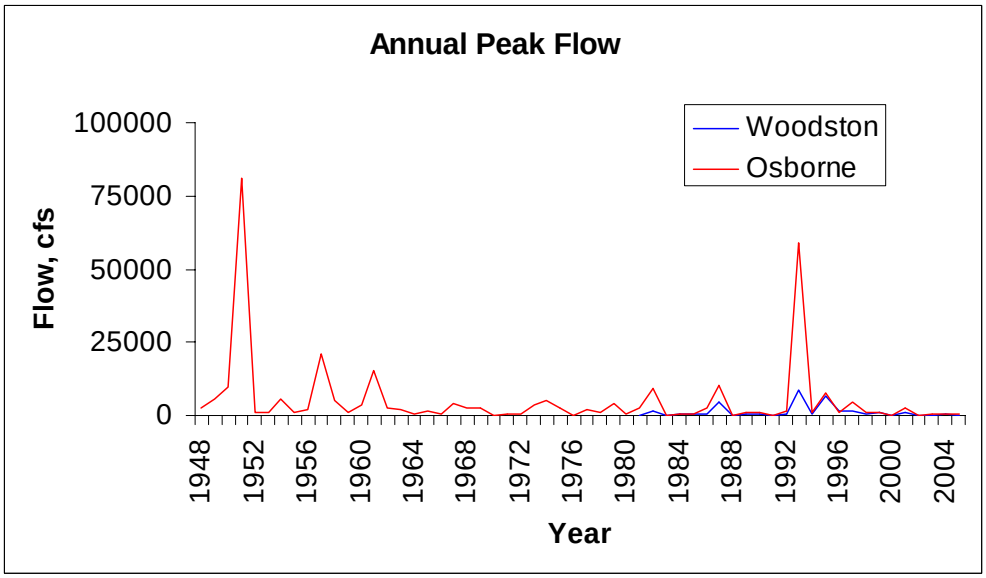
- Small grains and row crops are the predominant commodities grown in rotation on cropland. Wheat is the predominant crop grown. Corn is the predominant crop grown under irrigation.[6]
- Grasslands/Herbaceous and Pasture/Hay constitute approximately 62 percent of the watershed.
- Pasture is included on mostly beef operations, as well as a few small farms and ranches.
- Urban land comprises less than 1 percent of the HUC.

Irrigated Lands	Percent of Cropland	Percent of HUC
	3.6%	1.3%

3.4 Stream Flow Data[7, 8]

For this assessment, data was collected from two stream gage stations along the South Fork Solomon River: one at Osborne and one at Woodston. Stream flow data has been collected since 1948 at Osborne and 1980 at Woodston.





3.5 Other Physical Descriptions

		MILES
Stream Data	Total Miles	473[9]
Land Cover/Land Use[10]	**Acres**	**%**
Water	960	2.07
Low Intensity Residential	10	0.02
High Intensity Residential	6	0.01
Commercial/Industrial/Transportation	74	0.16
Bare Rock/Sand/Clay	56	0.12
Quarries/Strip Mines/Gravel Pits	0	0.00
Transitional	0	0.00
Deciduous Forest	1480	3.20
Evergreen Forest	39	0.08
Mixed Forest	0	0.00
Shrubland	1539	3.32
Grasslands/Herbaceous	23435	50.60
Pasture/Hay	5229	11.29
Row Crops	7000	15.11
Small Grains	4777	10.31
Fallow	6	0.01
Urban/Recreational	16	0.03
Woody Wetlands	26	0.06
Emergent Herbaceous Wetlands	1661	3.59
Total Acres of 100 foot Buffers[a]	46313	100.00

[a]: *Totals are approximate due to rounding and small unknown acreages.*

4.0 Resource Concerns

Resource concerns are issues related to the natural environment. Natural resources include soil, water, air, plants, animals, and humans. Watershed Restoration and Protection Strategy (WRAPS) Stakeholder Leadership Teams (SLT) identified major resource issues that affect the Lower South Fork Solomon sub-basin.

4.1 Summary of Resource Concerns[11]

Resource Concerns / Issues by Land Use								
Soil, Water, Air, Plant, Animal, plus Human (SWAPA +H) Concerns	**Specific Resource Concern / Issue**	Pasture/Hay	Grain Crops	Row Crops	Grazed Range	Forest	Wildlife	Urban
Water Quantity	Inefficient water use on irrigated land		X	X				
Water Quality, Ground Water	Harmful levels of pesticides			X				X
	Excessive nutrients and organics			X				
	Excessive salinity			X				
Water Quality, Surface	Harmful levels of pesticides		X	X				X
	Excessive nutrients and organics	X	X	X	X		X	X
	Excessive salinity			X				
	Harmful level of pathogens				X		X	X
Animal: Domestic	Inadequate stock water	X			X			

Soil, Water, Air, Plant, Animal, plus Human (SWAPA +H) Concerns	Specific Resource Concern / Issue	Pasture/Hay	Grain Crops	Row Crops	Grazed Range	Forest	Wildlife	Urban
Other Concerns: Water Conservation	Urban water conservation							X
	Flow meters and other water saving devices			X				
	Well head protection	X	X	X	X			X
	Comprehensive Nutrient Management Programs	X			X			
Human: Other Concerns	Household hazardous waste							X
	Municipal drought plan							X

Listed below are the concerns the SLT have expressed for their watershed.

Water Quantity

a. Low flow home units (show economic savings).
b. General education to the public about water use and possible pollutants to our water supply through newsletters, brochures in city water bills, newspaper articles, CD newsletters.
c. Reduce the water wasted by inefficient Irrigation.
d. Encourage CDs with in the watershed to set up rules enforcing the use of flow meters and other water saving devices.
e. Demonstrate these tools in a field day setting.
f. Promote government programs such as Environmental Quality Incentives Program (EQIP).
g. Educate public on water usage during the growth cycle of a crop, both irrigated and non-irrigated. Also, educate about how economics play a role.
h. Plan for drought condition and educate public on ways to conserve water.
i. Promote conservation practices with urban and rural residents through education.
j. Make sure city drought plan is up to date.

Water Quality

a. Educate public about wellhead protection areas by placing signage and using source water brochures from the Kansas Department of Health and Environment (KDHE).
b. Make educational material available at place of purchase promoting proper application times and amounts.
c. Encourage the use of buffer strips by explaining the damage done to aquatic life from chemical and fertilizer contamination.
d. Hold a field day to demonstrate the use of alternative, organic, or more earth friendly fertilizers.
e. Educate public on the economics of over fertilization or chemical use.
f. Partner with organizations already existing to help get the word out.

Animal: Domestic

a. Demonstrate and educate on alternative livestock watering systems; i.e., stream crossing, fencing off ponds/river, automatic waters, etc.
b. Public signage and education of proper pet waste disposal placed in parks, vet offices, feed mill, city offices, etc.
c. Promote and create a comprehensive nutrient management program for ag producers' individual needs.

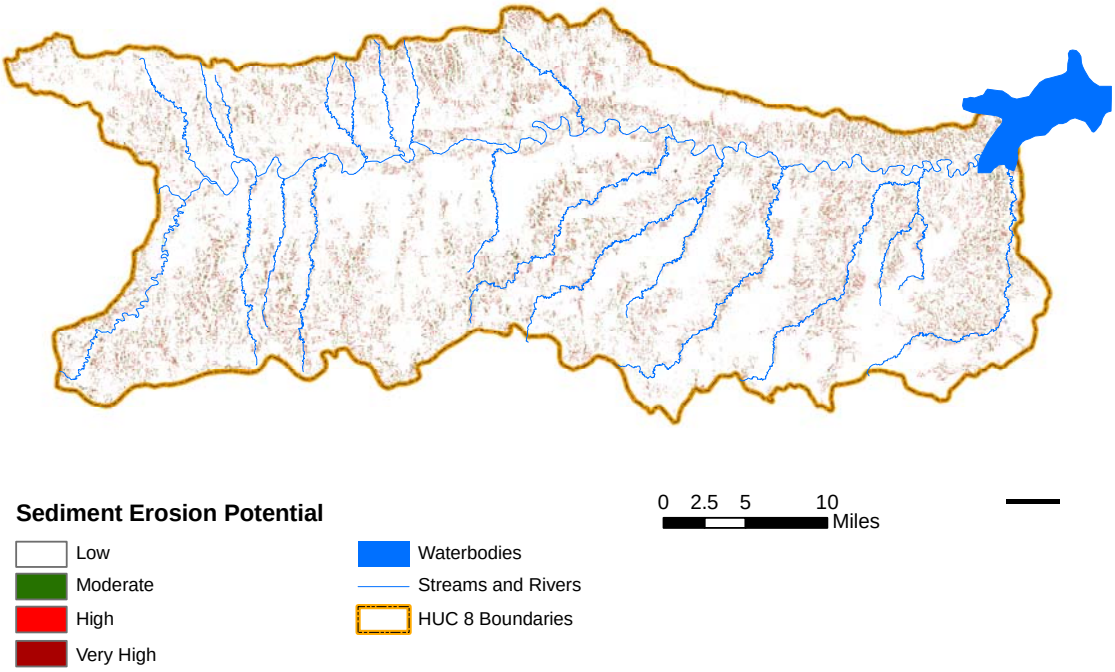
Human: Other Concerns

a. Illegal dumping of trash.
   1. Educate public on current household hazardous waste disposal sites and help coordinate sites for those areas where one is not available.
   2. Have an ag waste clean up day(s).
b. Increase the general education of the public about water quality and quantity.
   1. Newspaper articles or a weekly column.
   2. Newsletters; Farm Service Agency (FSA), NRCS, Extension, etc.

3. Radio Public Service Announcement (PSA).
4. City water bill brochures.
5. Short mailings with humor included.
6. Education on the windshield at ball games with humor included.
7. Girl Scouts.
8. E.A.R.T.H. program from middle school students.
9. World Water Monitoring Day for all ages.
10. Quick read of fact with eye appeal.
11. Brochures or placemats at restaurants.
12. Booth at county fairs.

4.2 Sediment Erosion Potential[12]

Geographic Information System (GIS) was utilized to assess terrestrial landscapes for erosion potential by calculating a Revised Universal Soil Loss Equation (RUSLE) value on a raster basis (30 m X 30 m).



4.3 Water Quality Conditions

The Kansas Department of Health and Environment (KDHE) is responsible for monitoring water quality conditions in the state of Kansas. This section is provided by KDHE. For up-to-date water quality condition information, visit the KDHE Web site: http://www.kdheks.gov/tmdl/solomon.htm.

4.3.1 Confined Animal Feeding Operations

In Kansas, confined animal feeding operations (CAFOs) with an animal unit capacity of 300 or more must register with the KDHE. Waste disposal practices and the wastewater effluent quality of these registered CAFOs are closely monitored by the KDHE to determine the need for runoff control practices or structure in order to protect the waters of the state of Kansas. Because of this monitoring, registered CAFOs are not considered a significant threat to water resources within the watershed. A

portion of the state's livestock population exists on small, unregistered farms. These small, unregistered livestock operations may contribute a significant source of fecal coliform bacteria and nutrients, depending on the presence and condition of waste management systems and proximity to water resources.

Confined Animal Feeding Operations Registry Table[13]

Animal/Operation Type	Dairy	Feedlot	Poultry	Swine
Number of Permitted Farms	3	15	0	6
Number of Certified Farms	2	15	0	0
Total Number of Animal Units	616	21,024	0	2,411

4.3.2 Public Water Supply Systems

In the state of Kansas, a public water supply system is defined by Kansas Statutes Annotated (K.S.A.) 65-162a and Kansas Administrative Regulations (K.A.R.) 28-15a-2 as a "system for delivery to the public of piped water for human consumption that has at least 10 service connections or regularly serves at least 25 individuals daily at least 60 days out of the year." These systems are regulated by the state to assure the citizenry safe and pathogen-free drinking water and are comprised of water intakes, wells, and water treatment facilities. The KDHE oversees more than 1,080 statewide public water supply systems including municipalities, rural water districts, and privately owned systems. These systems may serve a small community of several families to a city of more than 300,000 persons.

There are approximately 34 active public water supply wells located within this watershed. Due to the lack of surface water in this watershed, only one public water supply draws from surface water – the South Fork Solomon River. Major groundwater aquifers underlying this watershed include the Dakota Aquifer and small branches of the High Plains Aquifer along with alluvial aquifers of the South Fork Solomon River and its tributaries.

Source Water Assessment: The 1996 amendments to the Safe Drinking Water Act required each state to develop a Source Water Assessment Program (SWAP). Additionally, each state was required to develop a Source Water Assessment (SWA) for each public water supply that treats and distributes raw source water. In Kansas, there are approximately 763 public water supplies that required SWAs. A SWA includes the following: delineation of the sSWA area; inventory of potential contaminant sources, and an analysis of the susceptibility of the water source to the potential contaminants. The SWA must also be made available to the public. KDHE's Watershed Management Section has implemented the Kansas SWAP plan, and all SWAs are completed.

The Safe Drinking Water Act did not require protection planning to be part of the SWAP process. On a voluntary basis, KDHE encourages public water supplies and their surrounding communities to use the SWAs as the foundation for future protection planning efforts. Source water protection information will be posted on this site as it is compiled.

To obtain a copy of SWAs in this watershed please visit: http://www.kdheks.gov/nps/swap/SWreports.html.

4.3.3 Designated Uses[14]

According to the Kansas Surface Water Register, the most *common* designated uses for streams and rivers in this watershed include expected aquatic life use, secondary contact recreation, and food procurement. The table below lists designated uses by stream and impairments in the watershed.

Designated Uses Table								
Stream Name	**AL**	**PCR**	**DS**	**FP**	**GR**	**IW**	**IR**	**LW**
Ash Cr	E							
Boxelder Cr	E							
Carr Cr	E		X	X				
Coclebur Cr	E							
Covert Cr	E			X				
Crooked Cr	E							
Dibble Cr	E							
Elm Cr	E							
Jim Cr	E							
Kill Cr	E			X				
Kill Cr East	E							
Lost Cr	E							
Lucky Cr	E							
Medicine Cr	E							
Robbers Roost Cr	E							
Sand Cr	E							
S Fork Solomon River, segments 2, 3, 4, 5, 6, 7, 8, 9, 10	E	X	X	X	X	X	X	X
S Fork Solomon River, segment 798	E	X	X		X	X	X	X
Twin Cr	E			X				
Twin Cr E	E							

AL = Aquatic Life Support
PCR = Contact Recreation Use
DS = Domestic Water Supply
FP = Food Procurement
GR = Groundwater Recharge
IW = Industrial Water Supply
IR = Irrigation Water Supply
LW = Livestock Water Supply

E = Expected Aquatic Life Use Water
X = Referenced stream segment is assigned the indicated designated use
O = Referenced stream segment does not support the indicated beneficial use

4.3.4 Total Maximum Daily Loads

Total Maximum Daily Loads (TMDLs) are limits on the amount of pollutant entering a stream or lake, while still attaining water quality standards. The water quality standards identify the designated uses of streams, lakes, and wetlands and the level of water quality necessary to fully support these uses. The process of developing TMDLs in Kansas determines:

1. The pollutants causing water quality impairments.
2. The magnitude of the impairment relative to applicable water quality standards.
3. The overall level of pollution reduction needed to attain achievement of water quality standards.
4. The allocation of pollutant loads to be distributed among point and non-point sources in the watershed affecting the water quality limited water body.
5. Suggested corrective actions and management practices to be implemented in order to achieve the load allocations, TMDLs, and water quality standards.
6. The monitoring and evaluation strategies needed to assess the impact of corrective actions in achieving TMDLs and water quality standards.
7. Provisions for future revision of TMDLs based on those evaluations.

The following table shows stream miles within the watershed that are listed on the 303d list. Section 303(d) of the Clean Water Act requires states to identify and list all water bodies where state water

quality standards are not being met. Thereafter, TMDLs compromising quantitative objectives and strategies have been developed for these impaired waters within the watershed in order to achieve their water quality standards. For additional TMDL information or to download the TMDL report, visit http://www.kdheks.gov/tmdl/index.htm.

Stream Data	
Stream Miles	473
Stream miles that do not meet designated uses, miles	158[15]

2004 Impaired Waters with TMDLs[16]		
Stream/Lake with TMDL	**Priority for TMDL Implementation**	**Impairments**
Carr Creek	Low	Sulfate
Covert Creek	Low	Selenium
Covert Creek	Low	Sulfate
Kill Creek (Bloomington)	Low	Selenium
Kill Creek (Bloomington)	Low	Sulfate
Lower S Fk Solomon River	Low	Selenium
Lower S Fk Solomon River	Low	Sulfate
Lower S Fk Solomon River	Low	Biology
Twin Creek	Medium	Dissolved Oxygen
Rooks Co State Fishing Lake/Wildlife Area	Medium	Eutrophication
Rooks Co State Fishing Lake/Wildlife Area	Medium	Dissolved Oxygen

2006 Impaired Waters Needing TMDLs[17]		
Impaired Stream/Lake	**Impairment**	**Priority**
Twin Creek	Selenium	Low
Lower Vermillion Creek	Selenium	Low
Lower S Fk Solomon River (Rooks Co)	Dissolved Oxygen	Low
Lower S Fk Solomon River (Rooks Co)	Sulfate	Low
Lower S Fk Solomon River (Osborne Co)	E Coli Bacteria	Low

Impairment definitions:

Sulfate: Sulfate is a naturally occurring mineral that can cause taste and odor problems in drinking water. Sulfates are dissolved into groundwater as the water moves through gypsum rock formations. The water quality standard for sulfate in Kansas is 250ug/L.

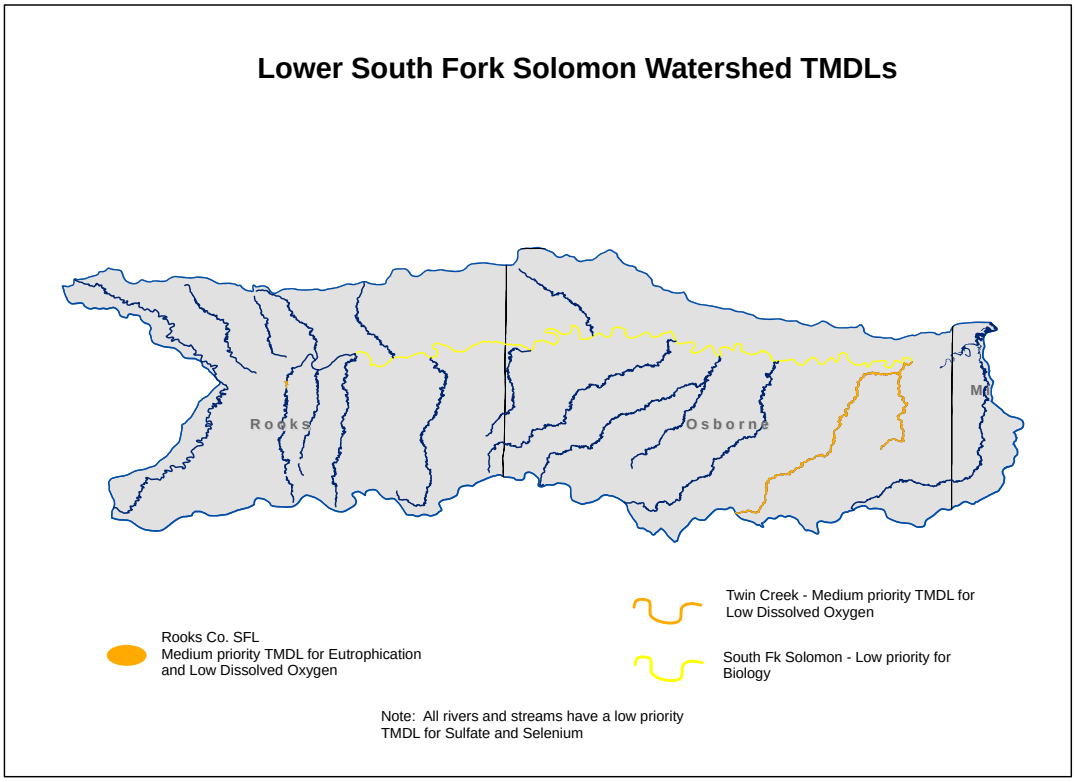
Selenium: A naturally occurring metal in marine shale that serves as a micronutrient. Excessive amounts impair aquatic life and bioaccumulation up the food chain occurs causing toxicity to birds, mammals, and humans. Kansas water quality standards are an average of 5ppb and a maximum of 20ppb.

Biology: Excess nutrients and organic enrichment in stream water can have a negative influence on aquatic populations. Nitrogen and phosphorus can originate from agricultural fertilizers, urban fertilizers, failing septic systems and livestock or wildlife manure in the stream.

E. coli Bacteria: Bacteria indicators (either fecal coliform or *E. coli*) are found in the digestive systems of warm-blooded animals. In surface waters, E. coli bacteria are an indicator of potential disease causing organisms. Potential sources of bacteria contamination in surface waters include municipal wastewater, livestock, septic systems, pets, and wildlife.

Dissolved Oxygen: Oxygen available to aquatic life with the water column. State water quality standards require a stream or lake to have at least 5mg/L of dissolved oxygen.

Eutrophication: Excessive nutrients entering water body causing an increase in algae to nuisance conditions, impairing aquatic life, recreation, and water supply uses.



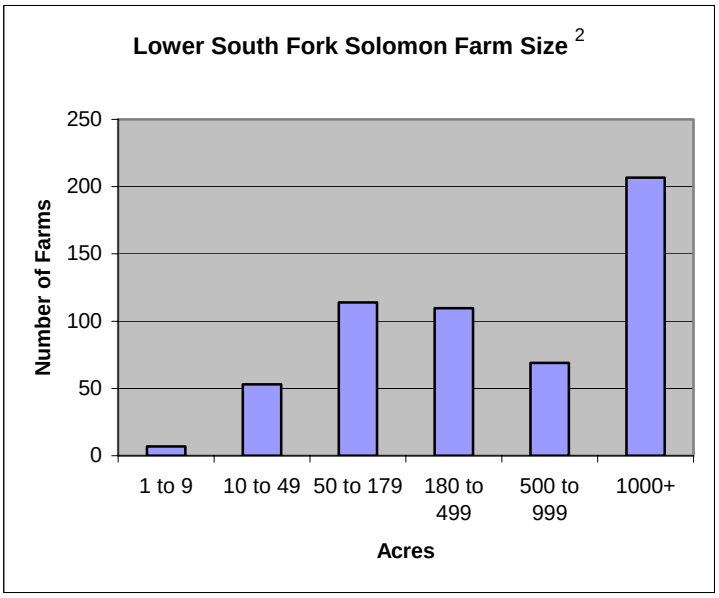
4.4 Threatened and Endangered Species Status[18]

The Endangered Species Act provides protection to animals that are experiencing a decline in population, or nearing extinction. The table below lists species of concern and their federal and state designation(s).

LISTED THREATENED AND ENDANGERED SPECIES			
Species Common Name (*Scientific name*)	**Threatened (THR), Endangered (END), Proposed (P), Candidate (C)**	**Designated Critical Habitat (Y)es/(N)o**	**Listing: Federal (F), State (S)**
Animals, Vertebrates - Birds			
Bald Eagle (Haliaeetus leucocephalus)	THR	Y	F, S
Eskimo Curlew (Numenius borealis)	END	N	F, S
Least Tern (Sterna antillarum)	END	N	F, S
Peregrine Falcon (Falco peregrinus)	END	N	S
Piping Plover (Charadrius melodus)	THR	N	F, S
Snowy Plover (Charadrius alexandrinus)	THR	N	S
Whooping Crane (Grus americana)	END	N	F, S
Animals, Vertebrates - Fishes			
Topeka Shiner (Notropis topeka)	END, THR	N	F, S
Animals, Vertebrates - Mammal			
Eastern Spotted Skunk (Spilogale putorius)	THR	N	S

SPECIES IN NEED OF CONSERVATION		
Species Common Name (*Scientific name*)	**Status: Species in Need of Conservation (SNC)**	**Listing: Federal (F) State (S)**
Animals, Vertebrates - Birds		
Black Tern (Chlidonias niger)	SNC	S
Bobolink (Dolichonyx oryzivorus)	SNC	S
Ferruginous Hawk (Buteo regalis)	SNC	S
Golden Eagle (Aquila chrysaetos)	SNC	S
Long-billed Curlew (Numenius americanus)	SNC	S
Short-eared Owl (Asio flammeus)	SNC	S
Animals, Vertebrates - Fishes		
Plains Minnow (Hybognathus placitus)	SNC	S
Animals, Vertebrates - Mammal		
Franklin's Ground Squirrel (Spermophilus franklinii)	SNC	S
Southern Bog Lemming (Synaptomys cooperi)	SNC	S
Animals, Vertebrates - Reptiles		
Eastern Hognose Snake (Heterodon platirhinos)	SNC	S
Western Hognose Snake (Heterodon nasicus)	SNC	S

5.0 Census and Social Data



Number of Farms: 564
- Average Farm Size: **1,200 acres**

Number of Operators: 1,035
- Principle Full-Time Operators: **388**
- Principle Part-Time Operators: **647**

5.1 Estimated Level of Willingness and Ability to Participate in Conservation[19]

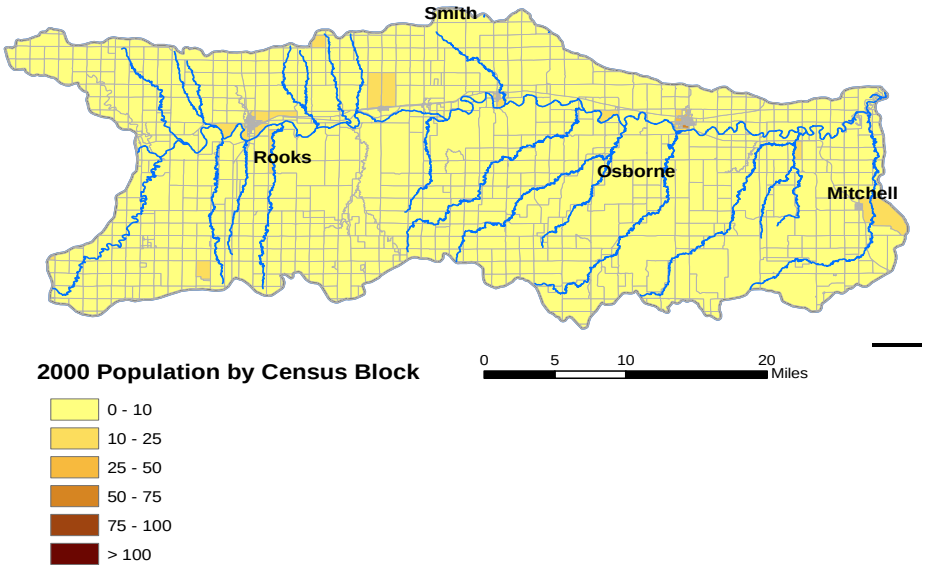
There is a likelihood of full conservation participation in the first 5 years with moderate adjustments in technical and financial assistance, and conservation marketing. There are high management skills in the watershed. Technical assistance delivery system is effective indicating that the residents of the watershed are aware that technical assistance is available. The information and education delivery system needs minor modifications. Existing financial incentives need to be expanded or increased to improve the participation rate and accelerate participation.

5.2 Evaluation of Social Capital[20]

Social capital is defined as bonds of trust that arise between people interacting in everyday life. Local conservationists developed a summary of social capital for this sub-basin and concluded the following:

> Watershed residents are highly motivated to be active citizens. They are actively involved in volunteering in community projects, church memberships, vote regularly, have a high school degree and are connected via the Internet. They are also involved in Parent Teacher Association, civic and charitable groups, and community decisions, with minority participation being slightly above average. They are average or slightly below average in participating in environmental concerns or public meetings.

5.3 Population Distribution Map (2000)[21]



6.0 Conservation Progress

Conservation on the land is defined by the progress made by local landowners and operators addressing resource issues. Progress is typically accomplished through private, local, state, and federal funds. This data is current through the date the RWA was published. For up-to-date NRCS Performance Results System (PRS) information, visit http://ias.sc.egov.usda.gov/prsreport2006/PRSReports.aspx.

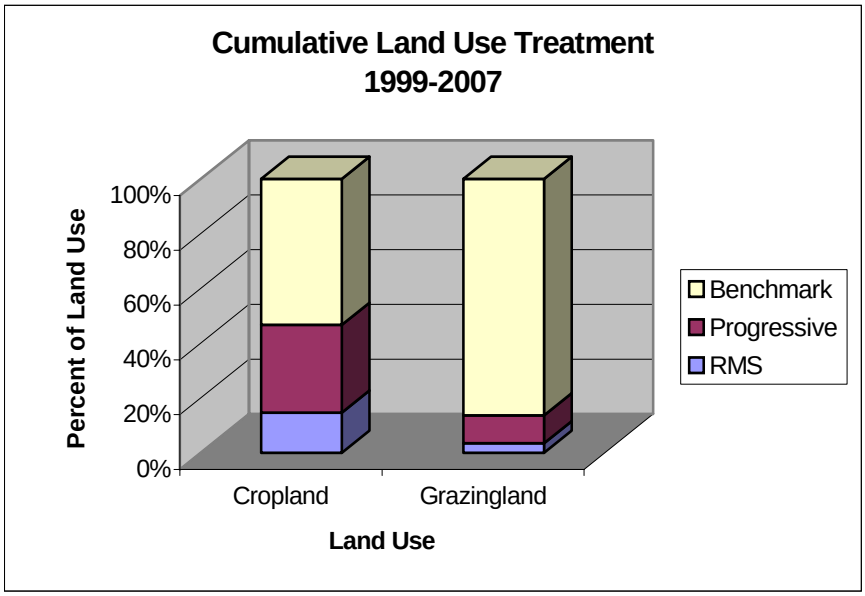
6.1 Reported Conservation Progress (2003 – 2007)

PRS Data	FY03	FY04	FY05	FY06	FY07	Avg/Year	Total
Total Conservation Systems Planned (no)	NA	30	113	40	19	51	202
Total Conservation Systems Applied (no)	NA	27	80	37	22	42	166
Conservation Treatment (Units/Acres)							
Brush Management (ac)			13	167	154	67	334
Total Comprehensive Nutrient Management Plans (Numbers)	2		2	1		1	5
Conservation Completion Incentive First Year (no)				2		*	2
Conservation Crop Rotation (ac)		3,987	5,933	9,971	3,436	4,665	23,327
Contour Farming (ac)		1,500	1,067	304	865	747	3,736
Cover Crop (ac)		63	93	449	7	122	612
Critical Area Planting (ac)			2	5		1	7
Diversion (ft)		1,469		273		348	1,742
Erosion Reduction Applied (ac)	6,060					1,212	6,060
Fence (ft)		2,402	6,236	2,746	6,751	3,627	18,135
Filter Strip (ac)		75		40	35	30	150
Forage Harvest Management (ac)		75	111	61		49	247
Grade Stabilization Structure (no)		1				*	1
Grassed Waterway (ac)		12	7	8	3	6	30
Irrigation System, Microirrigation (no)			136			27	136
Irrigation System, Sprinkler (no)			59			12	59
Irrigation Water Conveyance, Pipeline, High-Pressure, Underground, Plastic (ft)			2,680			536	2,680
Irrigation Water Management (ac)				58		12	58
Mulching (ac)		9	2,420	10		488	2,439
Nutrient Management (ac)		2,261	2,367	1,881	6,901	2,682	13,410
Pasture and Hay Planting (ac)					72	14	72
Pest Management Systems Applied (ac)	4,219	1,545	1,430	778	914	1,777	8,886
Pipeline (ft)		34,301	53,574	26,110	27,797	28,356	141,782
Prescribed Burning (ac)				42	270	62	312
Prescribed Grazing (ac)	5,116	3,631	2,725	2,519	2,696	3,337	16,687
Pumping Plant (no)					1	*	1
Range Planting (ac)		18		206	76	60	300
Residue and Tillage Management, Mulch Till (ac)					273	55	273
Residue and Tillage Management, No-Till/Strip Till/Direct Seed (ac)					1,069	214	1,069
Residue Management, No-Till/Strip Till (ac)		1,460	2,779	10,005	5,311	3,911	19,555
Residue Management, Seasonal (ac)		1,147	383	347	827	541	2,704
Restoration and Management of Declining Habitats (ac)			54	232	60	69	346
Sediment Basin (no)		1				*	1
Spring Development (no)		1		2		1	3
Terrace (ft)		66,425	76,225	155	26,081	33,777	168,886
Total Conservation Buffers (ac)	93					19	93
Total Residue Management (ac)	3,314					663	3,314
Total Wildlife Habitat (ac)	2,813					563	2,813
Tree & Shrub Establishment (ac)	5	1				1	6
Underground Outlet (ft)		334				67	334
Upland Wildlife Habitat Management (ac)		1,531	305	1,452	2,097	1,077	5,385
Use Exclusion (ac)		1,296	275	991	1,028	718	3,590

Conservation Treatment (Units/Acres)	FY03	FY04	FY05	FY06	FY07	Avg/Year	Total
Waste Storage Facility (no)		1	1			*	2
Waste Utilization (ac)				323	383	141	706
Water Well (no)				2	2	1	4
Watering Facility (no)		13	24	9	13	12	59
Wetland Enhancement (ac)				23	26	10	49
Wetland Restoration (ac)				18		4	18
Wetland Wildlife Habitat Management (ac)				38		8	38
Windbreak/Shelterbelt Establishment (ft)		8,349	860	5,760		2,994	14,969

6.2 Cumulative Conservation Status

Conservation plans developed and applied from 1999 to 2007 are projected in the following graph.



Note:

- *Benchmark (BM) refers to untreated lands within the watershed.*
- *Progressive refers to a resource in which some practices have been implemented, but does not meet established quality criteria.*
- *Resource Management Systems (RMS) refers to a combination of practices that currently meet, or when installed will meet or exceed established quality criteria.*

6.3 Other Watershed Projects

NRCS Watershed Plans, Studies, and Assessments[22]		NRCS Watershed Projects	
NAME	STATUS	NAME	STATUS
None	None	None	None
Watershed 319 Projects			
WRAPS – Lower North Fork, Lower South Fork, Upper North Fork and Upper South Fork Solomon Watersheds			

6.4 Lands Applications through Farm Bill Programs[23]

Conservation Reserve Program (CRP) 2007 Expiring Contracts[24]	**16,223 acres**
Conservation Security Program (CSP) 2004-2006	**48,702 acres**
EQIP 2006	**14,962 acres**
EQIP Ground and Surface Water Conservation (GSWC) 2002-2006	**1,816 acres**
Farm and Ranch Lands Protection Program (FRPP)	**None**
Grassland Reserve Program (GRP)	**None**
Wetlands Restoration Program (WRP)	**None**
Wildlife Habitat Incentives Program (WHIP) 2006	**93 acres**

7.0 Assessment

Introduction

This assessment matrix has been developed to provide an estimate of conservation systems, which may be needed to address resource concerns identified in the RWA Resource Profile. This can also be described as likely future conditions within the watershed.

Conservation systems have been described in this assessment as systems of conservation practices developed to address resource concerns on various land uses. Systems include BM)and RMS. BM systems are best described as land units that have had no treatment or one or more resource concerns treated with conservation practices. RMS are described as land units that have all known resource concerns treated with conservation practices. The level of treatment to an individual resource concern is credited when the practice(s) used meet or exceed a predetermined level of treatment, known as quality criteria.

Only priority resource concerns have been described in this RWA. Local resource professionals identified these concerns. Other resource concerns likely exist within the watershed but only make up a small percentage of what needs to be treated. Further investigation and analysis will need to be completed in order to better define all resource concerns.

Resource professionals provided an estimate by percent of conservation systems that will likely be applied to BM systems and untreated land units to address resource concerns identified in the resource profile. These systems are not meant to be comprehensive or address all resource concerns for each land unit in the watershed; rather, only the typical system of conservation practices that could be applied. Numerous alternatives and combinations of practices exist that should be made available to landowners and producers in order to meet their desired level of treatment.

Federal programs identified to implement conservation systems include, but are not limited to EQIP, WHIP, and WRP. Other funding available for implementation includes various private, local, and state program funds.

This assessment provides estimates only that have been developed using local conservationists and work groups to identify resource concerns, participation rates, and conservation systems likely to be applied. This information was merged with state average cost lists and estimated operation and maintenance costs to generate a cost estimate by individual practice for each conservation system projected to be applied.

Further investigation and analysis within the watershed is required to identify all resource concerns and locations of conservation practices and systems needed to address resource concerns.

7.1 Cropland

7.1.1 Dryland

Current Conditions	Cultivated / Non-Cultivated*	Dryland	Irrigated	Total	
Total Cropland	140,000	131,527	8,473	140,000	Acres
Cropland Needing Treatment	70,000	65,764	4,237	70,000	Acres
Cropland Currently at RMS Level**	20,440	19,203	1,237	20,440	Acres
Cropland Currently at Progressive Level***	44,940	42,220	2,720	44,940	Acres
Cropland Currently at Untreated Level	74,620	70,104	4,516	74,620	Acres
Typical Cropland-Dryland Management Unit	320				Acres

** Non-cultivated cropland is cropland that has been planted to a perennial crop such as alfalfa.*
*** RMS level is a level of treatment that meets or exceeds NRCS quality criteria as defined in the electronic Field Office Technical Guide.*
**** Progressive level defines a management unit that does not have all resource concerns treated to the RMS level.*
Note: For this analysis, all untreated units and progressive systems will be treated to RMS level.

Current Conditions for Cropland - Dryland

Management Systems		Quantity		Costs		Effects				Note:
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Soil Erosion	Soil Condition	Water Quantity	Quality, Surface	
BM1		Ac.	70,104			-3	-1	-3	-2	Effects are numerical values placed on benchmark conditions and degree of change in condition by conservation system(s) application. Scale range from -5 (most damaging to resources) to +5 (least damaging, best protection offered by treatment).
	Conservation Cropping Rotation	Ac.	70,104							
	Conventional Tillage	Ac.	70,104							
BM2			42,220			0	-1	-2	-1	
	Conservation Cropping Rotation	Ac.	42,220							
	Crop Residue Use	Ac.	42,220							
	Terrace	Ac.	8,866							
RMS		Ac.	19,203			+1	0	0	+1	
	Conservation Cropping Rotation	Ac.	19,203							
	Conservation Tillage	Ac.	19,203							
	Nutrient Management	Ac.	19,203							
	Pest Management	Ac.	19,203							
	Terrace	Ac.	4,033							

Desired / Estimated Participation Rates

	Proposed Practice Change	Rate	Acres
	Cropland-Dryland Conservation System	57%	37,485
	Cropland-Irrigation Conservation System	57%	2,415
		Total	39,900

Estimates:
110,000 Acres needing terraces
65,764 Acres needing treatment
28,278 Acres are not expected to be treated

Future Conditions		Total	BM1	BM2	RMS	RMS1	RMS2	RMS3
	Crop - Dryland	131,527	29,936	44,903	19,203	17,618	12,745	7,122

Future Conditions for Cropland - Dryland

Management Systems		Quantity		Costs		Effects				Implementation			
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality, Surface	EQIP	WHIP	WRP	Other
BM1		Ac.	29,936			-3	-1	-3	-2				
	Conservation Cropping Rotation	Ac.	29,936		$17,961								
	Crop Residue Use	Ac.	29,936		$3,592								
BM2		Ac.	44,903			0	-1	-2	-1				
	Conservation Cropping Rotation	Ac.	44,903		$26,942								
	Crop Residue Use	Ac.	44,903		$5,388								
	Terrace	Ac.	9,430		$1,120,248								
RMS		Ac.	19,203			+1	+1	+1	+1				
(Current RMS)	Conservation Cropping Rotation	Ac.	19,203		$11,522								
	Conservation Tillage	Ac.	19,203		$17,283					X			
	Nutrient Management	Ac.	19,203		$15,362					X			
	Pest Management	Ac.	19,203		$11,522					X			
	Terrace	Ac.	4,033		$91					X			X
RMS1		Ac.	17,618			+2	+3	+1	+2				
(Reduce soil erosion using mulch till)	Conservation Cropping Rotation	Ac.	17,618	$105,708	$10,571								
	Crop Residue Use	Ac.	17,618	$105,708	$2,114					X			
	Terrace	Ft.	18,605,506	$16,744,955	$418,624					X			X
RMS2		Ac.	31,948			+2	+3	0	+3				
(Reduce sheet/rill erosion)	Conservation Cropping Rotation	Ac.	31,948	$191,687	$19,169								
	Crop Residue Use	Ac.	31,948	$191,687	$3,834					X			
RMS3		Ac.	7,122			+2	+3	+1	+2				
(Reduce soil erosion by wind)	Conservation Cropping Rotation	Ac.	7,122	$42,733	$4,273								
	Crop Residue Use	Ac.	7,122	$42,733	$855					X			
	Total RMS Costs			**$17,425,213**	**$1,689,351**								

Potential RMS Effects Summary for Cropland - Dryland

Cost Items and Programs	Costs *	O&M Costs
Potential Farm Bill Programs		
Annual Management Incentives (3 yrs - Incentive Payments)		$237,664
Operator Investment (25% Cost Share)	$4,356,303	
Federal Costs (75% Cost Share)	$13,068,910	
Total RMS Costs	**$17,425,213**	**$1,689,351**
Estimated Level of Participation	57%	
Total acres projected to be in RMS System	56,688	
Total Annual Crop Production Benefit	$191,146	

** 2006 Cost List*

Resource Management Systems application estimates provided by District Conservationists.

Beneficial Effects of Proposed RMS System

- Improves soil condition
- Increases soil organic matter
- Improves water quality by reducing erosion and sediment delivery to streams

7.1 Cropland

7.1.2 Irrigated

Current Conditions	Cultivated / Non-Cultivated*	Dryland	Irrigated	Total	
Total Cropland	140,000	131,527	8,473	140,000	Acres
Cropland Needing Treatment	70,000	65,764	4,237	70,000	Acres
Cropland Currently at RMS Level**	20,440	19,203	1,237	20,440	Acres
Cropland Currently at Progressive Level***	44,940	42,220	2,720	44,940	Acres
Cropland Currently at Untreated Level	74,620	70,104	4,516	74,620	Acres
Typical Cropland-Dryland Management Unit	160				Acres

** Non-cultivated cropland is cropland that has been planted to a perennial crop such as alfalfa.*
*** RMS level is a level of treatment that meets or exceeds NRCS quality criteria as defined in the electronic Field Office Technical Guide.*
**** Progressive level defines a management unit that does not have all resource concerns treated to the RMS level.*
Note: For this analysis, all untreated units and progressive systems will be treated to RMS level.

Current Conditions for Cropland - Irrigated

Management Systems		Quantity		Costs		Effects			
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality, Surface
BM1		Ac.	4,516			-3	-1	-3	-2
	Conservation Cropping Rotation	Ac.	4,516						
	Conventional Tillage	Ac.	4,516						
BM2			2,720			0	-1	0	-1
	Conservation Cropping Rotation	Ac.	2,720						
	Residue Management	Ac.	2,720						
	Irrigation Water Management	Ac.	2,720						
RMS		Ac.	1,237			+2	0	+1	+1
	Conservation Cropping Rotation	Ac.	1,237						
	Conservation Tillage	Ac.	1,237						
	Nutrient Management	Ac.	1,237						
	Pest Management	Ac.	1,237						
	Irrigation Water Management	Ac.	1,237						

Note: Effects are numerical values placed on benchmark conditions and degree of change in condition by conservation system(s) application. Scale range from -5 (most damaging to resources) to +5 (least damaging, best protection offered by treatment).

Desired/Estimated Participation Rates

	Proposed Practice Change	Rate	Acres
	Cropland-Dryland Conservation System	57%	37,485
	Cropland-Irrigation Conservation System	57%	2,415
		Total	39,900

Estimates:

4,237 Acres needing treatment

1,822 Acres are not expected to be treated

Future Conditions	Total	BM1	BM2	RMS	RMS1	RMS3	RMS3
Crop - Irrigated	8,473	1,928	2,893	1,237	1,135	797	483

Future Conditions for Cropland - Irrigated

Management Systems		Quantity		Costs		Effects				Implementation			
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Soil Erosion	Soil Condition	Water Quantity	Water Quality, Surface	EQIP	WHIP	WRP	Other
BM1		Ac.	1,928			-3	-1	-3	-2				
	Conservation Cropping Rotation	Ac.	1,928		$1,157								
	Residue Management	Ac.	1,928		$42								
BM2		Ac.	2,893			0	-1	0	-1				
	Conservation Cropping Rotation	Ac.	2,893		$1,736								
	Residue Management	Ac.	2,893		$64								
	Irrigation Water Management	Ac.	2,893		$3,182								
RMS		Ac.	1,237			+2	0	+1	+1				
(Current RMS)	Conservation Cropping Rotation	Ac.	1,237		$742					X			
	Residue Management	Ac.	1,237		$27					X			
	Nutrient Management	Ac.	1,237		$990					X			
	Pest Management	Ac.	1,237		$742					X			
	Irrigation Water Management	Ac.	1,237		$1,361					X			
RMS1		Ac.	1,135			+4	+3	+2	+2				
(Convert to pivot irrigation)	Conservation Cropping Rotation	Ac.	1,135	$6,810	$681								
	Crop Residue Use	Ac.	1,135	$6,810	$136					X			
	Irrigation System, Sprinkler (conversion)	No.	7	$404,329	$2,022					X			
	Irrigation Water Management	Ac.	1,135	$12,485	$1,248					X			X
RMS2		Ac.	797			+3	+3	0	+3				
(Improve irrigation water management)	Conservation Cropping Rotation	Ac.	797	$4,781	$478								
	Crop Residue Use	Ac.	797	$4,781	$96					X			
	Irrigation Water Management	Ac.	797	$8,766	$877					X			
RMS3		Ac.	483			+3	+3	0	+3				
(Cropping rotation)	Conservation Cropping Rotation	Ac.	483	$2,898	$290								
	Crop Residue Use	Ac.	483	$2,898	$58					X			
	Irrigation Water Management	Ac.	483	$5,313	$531					X			
	Total RMS Costs			**$448,761**	**$15,580**								

Potential RMS Effects Summary for Cropland - Irrigated

Cost Items and Programs	Costs *	O&M Costs
Potential Farm Bill Programs		
Annual Management Incentives (3 yrs - Incentive Payments)		$7,146
Operator Investment (25% Cost Share)	$112,190	
Federal Costs (75% Cost Share)	$336,571	
Total RMS Costs	**$448,761**	**$15,580**
Estimated Level of Participation	57%	
Total acres projected to be in RMS System	3,652	
Total Annual Crop Production Benefit	$4,643	

** 2006 Cost List*

Resource Management Systems application estimates provided by District Conservationists.

Beneficial Effects of Proposed RMS System

- Improves soil condition
- Increases soil organic matter
- Improves water quality by reducing erosion and sediment delivery to streams
- Decreases aquifer overdraft

7.2 Grazed Range

Native Grassland

Current Conditions	Grazed	Ungrazed	Total	
Total Grazed Range	361,055	0	361,055	Acres
Grazed Range Needing Treatment	80,000	0	80,000	Acres
Total Range with Brush Invasion	83,043	0	83,043	Acres
Cropland Currently at RMS Level**	2,720			Acres
Cropland Currently at Progressive Level***	8,240			Acres
Cropland Currently at Untreated Level	69,040			Acres
Typical Range Management Unit	320			Acres

*** RMS level is a level of treatment that meets or exceeds NRCS quality criteria as defined in the electronic Field Office Technical Guide.*
**** Progressive level defines a management unit that does not have all resource concerns treated to the RMS level.*
Note: For this analysis, all untreated units and progressive systems will be treated to RMS level.

Current Conditions for Grazed Range

Grazed Range		Quantity		Costs		Effects			
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Plant Condition	Water Storage	Habitat	WQ
BM1		Ac.	69,040			-3	-1	-3	-2
	Pond	No.	216						
	Watering Facility	No.	216						
	Fence	Mi.	647						
BM2		Ac.	8,240			0	+1	+1	+1
	Prescribed Grazing	Ac.	8,240						
	Pond	No.	26						
	Watering Facility	No.	26						
	Pipeline	Ft.	68,675						
	Fence	Mi.	77						
RMS		Ac.	2,720			+2	+2	+1	+1
	Brush Management	Ac.	2,720						
	Prescribed Burning	Ac.	2,720						
	Watering Facility	No.	9						
	Pipeline	Ft.	22,670						
	Pond	No.	9						
	Fence	Mi.	26						

Note: Effects are numerical values placed on benchmark conditions and degree of change in condition by conservation system(s) application. Scale range from -5 (most damaging to resources) to +5 (least damaging, best protection offered by treatment).

Desired / Estimated Participation Rates

	Proposed Practice Change	Rate	Acres
	Grazing System	57%	45,600
	Brush Management	57%	47,334
	Prescribed Burning	57%	45,600

Future Conditions	Total	BM1	BM2	RMS	RMS1	RMS2	RMS3
Grazed Range	361,055	125,094	187,641	2,720	22,800	13,224	9,576

Future Conditions for Grazed Range

Grazed Range and Forestlands		Quantity		Costs		Effects				Implementation			
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Plant Condition	Water Storage	Habitat	WQ	EQIP	WHIP	WRP	Other
BM1		Ac.	125,094			-3	-1	-3	-2				
	Pond	No.	195		$23,455								
	Watering Facility	No.	195		$8,991								
	Fence	Mi.	782		$165,124								
BM2		Ac.	187,641			0	+1	+1	+1				
	Prescribed Grazing	Ac.	187,641		$185,765								
	Pond	No.	293		$35,183								
	Watering Facility	No.	293		$13,487								
	Pipeline	Ft.	762,292		$13,721								
	Fence	Mi.	1,173		$247,686								
RMS		Ac.	2,720			+2	+2	+1	+1				
(Current RMS)	Brush Management	Ac.	2,720		$4,080								
	Prescribed Burning	Ac.	2,720		$5								
	Watering Facility	No.	9		$391								
	Pipeline	Ft.	22,670		$408								
	Pond	No.	9		$1,020								
	Fence	Mi.	26		$1								
RMS1		Ac.	22,800			+3	+2	+2	+1				
(Conversion to rangeland)	Prescribed Grazing	Ac.	22,800	$68,400	$22,572					X			
	Upland Wildlife Habitat Management	Ac.	22,800	$2,052,000	$25,650					X	X		X
	Streambank & Shoreline Protection *	Ft.	124,872	$7,492,320	$149,846					X			
RMS2		Ac.	13,224			+5	+2	+3	+2				
(Wildlife protection)	Brush Management	Ac.	13,224	$661,200	$19,836					X	X		
	Prescribed Grazing	Ac.	13,224	$39,672	$13,092					X			
	Upland Wildlife Habitat Management	Ac.	13,224	$1,190,160	$14,877					X	X		X
RMS3		Ac.	9,576			+5	+3	+2	+3				
(Improve forage for livestock)	Brush Management	Ac.	9,576	$478,800	$14,364					X	X		
	Prescribed Grazing	Ac.	9,576	$28,728	$9,480					X			
	Total RMS Costs			**$9,612,720**	**$897,386**								

Potential RMS Effects Summary for Grazed Range

Cost Items and Programs	Costs **	O&M Costs
Potential Farm Bill Programs		
Annual Management Incentives (3 yrs - Incentive Payments)		$119,871
Operator Investment (25% Cost Share)	$2,403,180	
Federal Costs (75% Cost Share)	$7,209,540	
Total RMS Costs	**$9,612,720**	**$897,386**
Estimated Level of Participation	57%	
Total acres projected to be in RMS System	22,800	
Total Annual Forage Production Benefits	$105,101	

**Estimation by KCARE work group and local District Conservationist (12% of total stream miles need protection)*

*** 2006 Cost List.*

Resource Management Systems application estimates provided by District Conservationists

Beneficial Effects of Proposed RMS System

Improves plant condition, health and vigor

Improves upland wildlife habitat for prairie chicken and other range dependant species

Improves water quality by reducing erosion and sediment delivery to streams

7.3 Pasture

Non-irrigated Pasture

Current Conditions	Grazed	Ungrazed	Total	
Total Pasture	55,450	0	55,450	Acres
Pasture Needing Treatment	10,979	0	10,979	Acres
Typical Pasture Management Unit	20			Acres

RMS level is a level of treatment that meets or exceeds NRCS quality criteria as defined in the electronic Field Office Technical Guide.
Benchmark defines a management unit that does not have all resource concerns treated to the RMS level.
Note: For this analysis, all benchmark systems will be treated to RMS level.

Current Conditions for Non-Irrigated Pasture

Pasture		Quantity		Costs		Effects			
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Plant Condition	Water Storage	Habitat	WQ
BM1		Ac.	10,979			-3	-1	-3	-2
	Pond	No.	34						
	Watering Facility	No.	51						
	Fence	Mi.	412						
BM2		Ac.	44,471			-1	+1	+1	+1
	Prescribed Grazing	Ac.	44,471						
	Pond	No.	139						
	Watering Facility	No.	139						
	Pipeline	Ft.	370,637						
	Fence	Mi.	1,668						

Note: Effects are numerical values placed on benchmark conditions and degree of change in condition by conservation system(s) application. Scale range from -5 (most damaging to resources) to +5 (least damaging, best protection offered by treatment).

Desired/Estimated Participation Rates

	Proposed Practice Change	Rate	Acres
	Pasture System	57%	6,258

Future Conditions		Total	BM1	BM2	RMS
	Pasture	55,450	4,721	44,471	6,258

Future Conditions for Non-Irrigated Pasture

Pasture		Quantity		Costs		Effects				Implementation			
	Practices	Unit	Quantity	Investment Cost	Annual O&M Cost	Plant Condition	Water Storage	Habitat	WQ	EQIP	WHIP	WRP	Other
BM1		Ac.	4,721			-3	-1	-3	-2				
	Pond	No.	15		$1,770								
	Water Facility	No.	15		$1,770								
	Fence	Mi.	177		$37,390								
BM2		Ac.	44,471			-1	+1	+1	+1				
	Prescribed Grazing	Ac.	44,471		$44,026								
	Pond	No.	139		$16,677								
	Water Facility	No.	139		$16,677								
	Pipeline	Ft.	370,637		$6,671								
	Fence	Mi.	1,668		$352,210								
RMS		Ac.	6,258			+3	+2	+1	+2				
(Cpnvert to pasture)	Pasture and Hay Planting	Ac.	6,258	$375,485	$3,755								
	Prescribed Grazing	Ac.	6,258	$18,774	$6,196					X			
	Fence	Mi.	235	$2,478,202	$49,564					X			X
	Nutrient Management	Ac.	6,258	$50,065	$5,006					X			
	Pest Management	Ac.	6,258	$37,549	$3,755					X			
	Water Facility	No.	20	$117,339	$2,347					X			X
	Pipeline	Ft.	52,157	$93,883	$939					X			X
	Total RMS Costs			**$2,795,812**	**$548,753**								

Potential RMS Effects Summary for Non-Irrigated Pasture

Cost Items and Programs	Costs *	O&M Costs
Potential Farm Bill Programs		
Annual Management Incentives (3 yrs - Incentive Payments)		$14,957
Operator Investment (25% Cost Share)	$698,953	
Federal Costs (75% Cost Share)	$2,096,859	
Total RMS Costs	**$2,795,812**	**$548,753**
Estimated Level of Participation	57%	
Total acres projected to be in RMS System	6,258	
Total Annual Forage Production Benefits	$33,446	

* 2006 Cost List

Resource Management Systems applications estimates provided by District Conservationists

Beneficial Effects of Proposed RMS System

Improves plant condition, health and vigor

Improves water quality by reducing erosion and sediment delivery to streams

8.0 Footnotes/Bibliography

All data is provided "as is." There are no warranties, express or implied, including the warranty of fitness for a particular purpose, accompanying this document. Use for general planning purposes only.

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